Cross Cascades Corridor Analysis Plan
Task Order AD
Work Program for Model Development
February 2, 2001

The focus of this workprogram is the development and peer review of the travel demand-forecasting model to be constructed for use in the Cross Cascades Corridor Analysis project. The chosen model approach, based on Workshop #1, and subsequent client meetings, is the Spatial Input/Output approach using the MEPLAN software package. The deliverables for this task order include:

(1) A documented interregional model for forecasting transportation (highway, rail, and air) movements in the Cross-Cascades Corridor and future Washington State corridor analyses. The criteria for development of the model are noted below in the list of WSDOT's objectives. Links to this model and its operations will be published in the project's web site. Some required outputs for the model were identified in Workshop #1.

(2) A hard copy memorandum (and summary document for the project's web site) summarizing key elements of the model.

(3) A report from the Peer Review Panel identifying its comments about the model, methodology and data, including suggestions for improving the value of the model for the later corridor analyses. This report will also be published on the project's web site.

(4) A workshop to train WSDOT users in use of the model.

The model developed in this effort will be guided by the following principles and objectives established by WSDOT:

- Capable of analyzing and estimating demand for highway, rail, and air modes
- Capable of producing interregional forecasts and analyses across the full length of the corridor
- Capable of providing 6-year and 20-year forecasts
- Transferable to other corridors and expandable for eventual use in analyzing the entire state transportation facilities and services of statewide significance.
- Capable of directly integrating output with other forecast models in use along the corridor.
- Utilize the WTP Policy framework as the principal criterion and scenarios for analysis.
- Capable of producing output in GIS or other "visually-friendly" and meaningful formats
- Simple to operate, modify, and update by WSDOT staff.
- Capable of providing data and/or model results to be used in subsequent corridor analyses.

The steps designed to meet these objectives are summarized below. A preliminary schedule is included in Figure 1.

Cross-Cascades Model Development
MEPLAN Model Development Workplan
Task List and Schedule

WSDOT Cross-Cascades Corridor Modeling Task	Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	++++
1 Develop Model Specification		▓	▓	▓	▓	▓	▓											
2 Develop Baseline Model Networks (base & future years)		Data Collection/Processing						▓	▓	▓								
3 Develop Zone System and data		▓	▓	▓	▓	▓	▓											
Develop Highway O-D Trip Table for Phase 2										▓	▓	▓						
4 Develop Assignment and Route Choice Functions		▓	▓	▓	▓	▓	▓	Build Components							Fine-Tune			
5 Develop Mode Split Functions		▓	▓	▓	▓	▓	▓	▓	▓	▓					▓	▓		
6 Develop Land Use Model		▓	▓	▓			▓	▓	▓	▓					▓	▓		
7 Trade-to-Trip Conversion Model (Generation Model)		▓	▓	▓		▓	▓	▓							▓	▓		
8 Establish Exogenous Travel Demand ("Through" Trips)		▓	▓	▓			▓	▓										
9 Establish consistent interaction for base year											Match Base Year		▓	▓	▓			
10 Develop Incremental Models (3 year steps)		▓	▓	▓	▓	▓							▓	▓	▓	▓	▓	
11 Meetings							X		▓	▓								Peer
12 Develop Documentation			▓	▓	▓	▓	▓	▓							▓	▓	▓	X
13 Training of WashDoT Staff																		X

Develop Model Specifications and Purchase Model Software

A Model Specification Plan will be developed to outline the key flows and interactions within the Spatial Input-Output model structure. Flows are categories of economic transactions, which generate trips that need to be accommodated by the transportation network. The flows used in the model will represent households of several types and a handful of industry sectors (or commodities). The Model Specification Plan will define the interactions within the model, including the nature of interactions between factors, whether these interactions are assumed fixed or price elastic in the model, exogenously generated (imports) and demanded (exports) activity, and other non-economically generated activity (e.g., retired and unemployed households). Other elements of the Model Specifications Plan will include selection of the analysis "day" (e.g. weekday/weekend, season, etc.) and conversion to peak period. The model specifications will be documented and presented for comment to the customer in Workshop #3, with updates as appropriate. Additionally, the MEPLAN software, developed by Marcial Echenique and Partners (ME&P), Cambridge, UK, will be purchased by WSDOT and provided to the HDR team during development of the model and future analyses of corridor conditions in Phase II of the project.

Develop Modal Networks

Modal networks will be developed for the following systems within the corridor. Attributes of a base year and no-build future year networks (in 3-year increments) will be defined. Although the focus will be on the I-90 corridor, the following modal networks may cover the state with some external linkages.

- Road network (Highways of State Wide Significance)
- Rail network (Amtrak passenger and BNSF Freight)
- Intercity Passenger Bus network (Greyhound and Northwest Trailways)
- Air network (Sea-Tac, Spokane, and possibly Wenatchee, Moses Lake)

For each of these networks, various attributes will be collected and defined, such as distances, speeds, travel times, capacities, service frequencies, and location of intermodal terminals. Cost functions will be generated to reflect travel costs or transport rates for each mode. The network data will be collected and processed for model use. Data sources and processing/cost function assumptions will be documented. Key network data sources and assumptions will be included for client comment in Workshop #3.

Develop Zonal System

The State of Washington and relevant external areas will be broken down into 50-100 zones. Within Washington, most zones will consist of counties, with possible multi-county zones or smaller township level zones, as appropriate. These zones will be designed to facilitate transfer with other models within the corridor. Some external zones will represent trips originations or destinations from other US regions, as well as Canada and Pacific Rim countries. Zone attributes will be collected for each zone, including population by income group and employment by sector, and processed for model use. Data sources and processing assumptions will be documented. Key zone data sources and assumptions will be included for client comment in Workshop #3.

Build and Estimate Model Components

The software package MEPLAN will be used to model economic-motivated travel under the Spatial Input/Output modeling approach for the I-90 corridor. This model will allow transferability to other corridors, and future expansion to state-wide model coverage. It should be noted, however, that for this project, although the modal networks extend into other corridors, complete network flows will only be developed for the network within the I-90 corridor. The following key model components will need to be developed:

- Assignment and Route Choice Functions
- Mode Split Functions
- Land Use Model
- Trade Trip Conversion Model (converts economic flows to transport flows)
- Exogenous Travel Demand ("through" trips)

A significant amount of data will be collected for use directly by the model and/or to assist in selection of various model parameters. The primary data is the Input/Output table and associated Make and Use Tables for the State of Washington. Import/export and through trip data (exogenous demands) will also be necessary to complete the economic picture. Because of the scope of this effort, model equations and coefficients will largely be borrowed from relevant existing models for other states/regions, including mode-specific utility functions, their parameters, coefficient sensitivities, and nesting structure. Other data will assist in selecting the appropriate model parameters to match base year economic and transport outputs. Economic data to be collected includes zonal population/employment, import/exports, and other work/vehicle data (e.g., vehicle occupancies, load factors, weight limits, daily labor attrition). Transport data includes passenger and freight demands (e.g., O-D), mode split, and observed network use (e.g., volumes, ridership, tonnage, average trip lengths) by mode and route segment. Similar data will be collected for "through" trips with simpler modeling assumptions made about the economic and transport behavior of these trips. The team will document key data sources and assumptions used in developing these model components.

Develop and Assess Full Model Interactions

This subtask will combine the various model components developed in the previous subtask. The process of assessing the validity of the model outputs will require fine-tuning of the parameters chosen for the individual model components developed initially. This effort includes development and assessment of the following:

- Establish consistent interaction for Base Year
- Develop incremental models (3-year steps)

The combined model output will be assessed against existing economic and transport forecasts for both base year and incremental future years. This data includes zonal population/employment, state-level import/exports, and state/US economic growth indicators (e.g., GNP). National information will be particularly helpful in estimating "through" trips.

Meetings

Communication of the modeling effort with WSDOT will include the following:

- **Workshop #3**– This workshop, anticipated in the second month of model development, will relay key model structure and analysis assumptions for WSDOT approval. Additionally, the meeting will relay the progress of the data collection effort, including the development of modal networks and zones, and identify any related issues for discussion. This workshop is expected to last between five and eight hours.

- **Phase 2 Data Linkage Decision Point** – At this key decision point, expected to occur two weeks following Workshop #3, the team will identify model progress and anticipated availability of model output to feed the Phase II I-90 corridor analysis effort. At this point, a decision will be made whether or not the team should pursue additional methods (e.g. synthesize O-D Trip Table) to support Phase II efforts. Additionally, model progress will be evaluated and a decision made as to whether model calibration will cover all modes or focus on highway modes.

- **Model Progress Checkpoints** – Internally, the team will assess model development every two weeks in order to assess progress and risks. Appropriate actions will be taken, as needed, to maintain schedule. These actions or decisions will be made in conjunction with key WSDOT staff.

- **Peer Review Panel Meeting** – Following the completion of the model, the team will conduct a Peer Review Panel meeting. This four-hour event will allow objective modeling experts a chance to assess the model's architecture, model objectives, data inputs, and model outputs, and provide suggestions for future model improvement. Depending on the timing of the meeting, output on the Phase II corridor analysis might also be included. An overview report of the model and a list of questions would be provided to the Panel in advance of the meeting to allow time for review. The actual meeting, facilitated by Sorin Garber and Mark Ford, would involve a presentation by the consultant team staff plus a demonstration of the model. This would be followed by a dialogue focusing on the list of questions supplied to the participants prior to the meeting. Following the meeting, the team will document concerns or recommendations identified by the panel.

- **WSDOT Model Training Workshop** - The team will develop a half-day workshop to train key WSDOT planning staff on the use of the developed model, as implemented with the MEPLAN software.

Documentation

Documentation of the model development effort will include the following:

- **Memorandum Describing Model Documentation** – A summary description of the model components, key data sources, and assumptions will be developed by the team and delivered after completion of the model.

- **Peer Review Panel Recommendations** – The comments, concerns, and suggestions of the Peer Review Panel will be documented by the team. This may include recommended data collection efforts and other model enhancements.

- **Website** – A model overview and selected key data inputs/outputs will be made accessible to the public on the WSDOT website page for this project, as developed by HDR.